Name: _____________________________________________

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DO NOT OPEN YOUR EXAM UNTIL TOLD TO DO SO.
You may use one page (one side) of notes and a calculator, but no other materials or resources (such as notes, old HW, etc.).
There is no sharing with a friend or neighbor.

FOR FULL CREDIT, SHOW ALL WORK RELATED TO FINDING EACH SOLUTION.
1. Suppose we roll two dice that are a little different than normal: they are numbered 1, 2, 3, 5, 6 and 7. We are interested in their sum. The sums of the 36 possible rolls are listed below. I’ve shaded the odd sums, to make it a bit easier to get the information you need from the table. In answering the following questions, leave your answers as fractions, but simplify the fractions where appropriate.

<table>
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<tr>
<th>Die 1</th>
<th>1</th>
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<th>3</th>
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<td>10</td>
<td>12</td>
<td>13</td>
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</table>

/3 What is the probability that the sum is even?

/3 What is the probability that the sum is ≥9?

/4 What is the probability that the sum is even and ≥9?

/4 What is the probability that the sum is even or ≥9?

/4 If we know that the sum is ≥9, what is the probability the sum is even?

/4 If we know that the sum is even, what is the probability that the sum is ≥9?

/3 Given that event E is that the sum of the dice is even and/or > 6 or that we rolled doubles (i.e. 1 and 1, 2 and 2, etc.), find Pr(E ∪ E’) and find Pr(E ∩ E’).
There is a bin that has 4 red and 3 yellow balls. You will select 3. Simplify each of these answers to be a simple fraction.

What is the probability that you select a red ball first, then a yellow ball, then another red ball (in that order)?

What is the probability of selecting 2 red balls and 1 yellow ball, regardless of the order you select them in?
3. Suppose that for events $E$ and $F$, $\Pr(E) = \frac{2}{6}$, $\Pr(F) = \frac{3}{6}$, and $\Pr(E \cap F) = \frac{1}{6}$.

Note/hint: use the diagram and/or some of the probabilities you find to find subsequent probabilities. Simplify your answers (the fractions) for this problem.

Draw a Venn Diagram representing the given information:

Find $\Pr(E \cup F)$.

Find $\Pr(E')$.

Find $\Pr(F')$.

Find $\Pr(E' \cap F')$.

Find $\Pr(E|F)$.

Find $\Pr(F|E)$.

Find $\Pr(E'|F)$.

Find $\Pr(F|E')$.

Are $E$ and $F$ independent events? Why or why not?

Are $E$ and $F$ mutually exclusive events? Why or why not?
4. Suppose a certain test can determine whether or not a person has the flu. Ideally, the test would be positive (meaning you do have the flu) 100% of the time for those who do have the flu, and negative (meaning you do not have the flu) 100% of the time for those who do not have the flu. Suppose in reality that of those who do have the flu, the test is positive only 96% of the time, and that of those who do not have the flu, only 95% test negative. Finally, based on past experience, assume that 10% of the population actually does have the flu.

Suppose a randomly selected person is tested. What is the probability this person will test positive? What is the probability this person will test negative? Simplify your answers.

Suppose a randomly selected person is tested and that the test is positive. What is the probability that this person does have the flu? What is the probability this person does not have the flu? Simplify your answers.

Suppose a randomly selected person is tested and that the test is negative. What is the probability that this person does have the flu? What is the probability this person does not have the flu? Simplify your answers.